

Claims

1. A G-protein fusion receptor comprising

an extracellular domain comprising an extracellular domain amino acid sequence  
5 substantially similar to either an extracellular CaR amino acid sequence, an extracellular  
mGluR amino acid sequence, or an extracellular GABA<sub>B</sub> receptor amino acid sequence;

a transmembrane domain joined to the carboxy terminus of said extracellular  
domain, said transmembrane domain comprising a transmembrane domain amino acid  
sequence substantially similar to either a transmembrane CaR amino acid sequence, a  
10 transmembrane mGluR amino acid sequence, or a transmembrane GABA<sub>B</sub> receptor amino  
acid sequence;

an intracellular domain joined to the carboxy terminus of said transmembrane  
domain comprising all or a portion of an intracellular amino acid sequence substantially  
similar to either an intracellular CaR amino acid sequence, an intracellular mGluR amino  
15 acid sequence, or an intracellular GABA<sub>B</sub> receptor amino acid sequence, provided that said  
portion is at least about 10 amino acids;

an optionally present linker joined to the carboxy terminus of said intracellular  
domain; and

a G-protein joined either to said intracellular domain or to said optionally present  
20 linker, provided that said G-protein is joined to said optionally present linker when said  
optionally present linker is present.

2. The G-protein fusion receptor of claim 1, wherein said extracellular  
domain consists of said extracellular domain amino acid sequence, said transmembrane  
25 domain consists of said transmembrane domain amino acid sequence; and said  
intracellular domain consists of said transmembrane domain amino acid sequence.

3. The G-protein fusion receptor of claim 2, wherein said optionally present  
linker is present and is a polypeptide 3 to 30 amino acids in length.

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4. The G-protein fusion receptor of claim 2, wherein said optionally present  
linker is not present.

5. The G-protein fusion receptor of claim 3 or 4, wherein said G-protein is selected from the group consisting of:  $G_{\alpha 15}$ ,  $G_{\alpha 16}$ , Gqo5, and Gqi5

6. The G-protein fusion of claim 5, wherein any of said CaR sequence present  
5 is a human CaR sequence, any of said mGluR sequence present is from a human mGluR, and any of said GABA<sub>B</sub> receptor sequence present is from human mGluR.

7. A nucleic acid comprising a nucleotide sequence encoding for the G-protein fusion of any one of claims 1-6.

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8. An expression vector comprising a nucleotide sequence encoding for the G-protein fusion of any one of claims 1-6 transcriptionally coupled to a promoter.

9. A recombinant cell comprising the expression vector of claim 8 and a cell  
15 wherein the G-protein fusion is expressed and is functional.

10. A recombinant cell produced by combining a vector comprising the nucleic acid of claim 9 and elements for introducing heterologous nucleic acid into a cell wherein the G-protein fusion receptor is expressed, and said cell.

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11. A process for the production of a G-protein fusion receptor comprising:  
growing procaryotic or eukaryotic host cells comprising a nucleic acid sequence  
expressing the G-protein fusion receptor of any one of claims 1-6, under suitable nutrient  
conditions allowing for cell growth.

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12. A method of measuring the ability of a compound to effect G-protein fusion activity comprising the steps of:

a) providing said compound to a cell expressing the G-protein fusion receptor of any one of claims 1-6, and

30 b) measuring the ability of said compound to affect the activity of said receptor as an indication of the ability of said compound to effect G-protein fusion receptor activity.

13. A chimeric receptor comprising

an extracellular domain comprising an extracellular domain amino acid sequence substantially similar to a sequence selected from the group consisting of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4 and SEQ ID NO: 5;

a transmembrane domain comprising a transmembrane domain amino acid  
5 sequence substantially similar to a sequence selected from the group consisting of SEQ ID NO: 6, SEQ ID NO: 7, SEQ ID NO: 8, SEQ ID NO: 9, and SEQ ID NO: 10; and

an intracellular cytoplasmic domain comprising an intracellular domain amino acid sequence substantially similar to a sequence selected from the group consisting of SEQ ID NO: 11, SEQ ID NO: 12, SEQ ID NO: 13, and SEQ ID NO: 14;

10 wherein at least one domain is present which comprises an amino acid sequence substantially similar to a sequence selected from the group consisting of: SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4, SEQ ID NO: 7, SEQ ID NO: 8, and SEQ ID NO: 9, SEQ ID NO: 12, SEQ ID NO: 13, and SEQ ID NO: 14; and at least one domain is present which comprises an amino acid sequence substantially similar to a sequence selected from  
15 the group consisting of: SEQ ID NO: 1, SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 10, SEQ ID NO: 11, and SEQ ID NO: 15.

14. The chimeric receptor of claim 13 wherein said extracellular domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group  
20 consisting of SEQ ID NOs: 2, 3, and 4; said transmembrane domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group consisting of SEQ ID Nos: 6, 7, 8, 9, and 10; and said intracellular domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group consisting of SEQ ID NOs: 11 and 15.

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15. The chimeric receptor of claim 14, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 2; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence SEQ ID NO: 7; and said intracellular domain has a sequence similarity of at  
30 least 90% with the amino acid sequence of SEQ ID NO: 11.

16. The chimeric receptor of claim 14, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 3; said

transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 8; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO 11.

5           17.     The chimeric receptor of claim 14, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence SEQ ID NO: 4; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 9; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO 11.

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          18.     The chimeric receptor of claim 13, wherein said extracellular domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group consisting of SEQ ID NOs: 1, 2, 3, 4 and 5; said transmembrane domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group consisting  
15 of SEQ ID Nos: 7, 8, and 9; and said intracellular domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group consisting of SEQ ID NOs: 11, 12, 13, 14, and 15.

          19.     The chimeric receptor of claim 18, wherein said extracellular domain has a  
20 sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 7; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 11.

25           20.     The chimeric receptor of claim 18, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 8; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO 11.

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          21.     The chimeric receptor of claim 18, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid

sequence of SEQ ID NO: 9; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO 11.

22. The chimeric receptor of claim 13, wherein said extracellular domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group consisting of SEQ ID NOs: 1, 2, 3, 4, and 5; said transmembrane domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group consisting of SEQ ID Nos: 6, 7, 8, 9, and 10; and said intracellular domain has a sequence similarity of at least 90% with an amino acid sequence selected from the group consisting of SEQ ID NOs: 12, 13, and 14.

23. The chimeric receptor of claim 22, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 6; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 12.

24. The chimeric receptor of claim 22, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 7; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 12.

25. The chimeric receptor of claim 22, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 8; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 13.

26. The chimeric receptor of claim 22, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid

sequence of SEQ ID NO: 6; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 13.

27. The chimeric receptor of claim 22, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 9; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 14.

28. The chimeric receptor of claim 22, wherein said extracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 1; said transmembrane domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 6; and said intracellular domain has a sequence similarity of at least 90% with the amino acid sequence of SEQ ID NO: 14.

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29. The chimeric receptor of any one of claims 13-28, wherein said receptor functional couples to a G-protein.

30. The chimeric receptor of any one of claims 13-28, wherein said chimeric receptor consists of said extracellular domain, said transmembrane domain, said intracellular domain, and an optionally present G-protein  $\alpha$  subunit covalently joined to said intracellular domain.

31. The chimeric receptor of claim 30, wherein said chimeric receptor consists of said extracellular domain, said transmembrane domain, and said intracellular domain.

32. The chimeric receptor of claim 30, wherein said G-protein  $\alpha$  subunit consists of the amino acid sequence of SEQ ID Nos: 16 or 17.

33. A nucleic acid comprising a nucleotide sequence encoding for the chimeric receptor of any one of claims 13-32.

34. An expression vector comprising a nucleotide sequence encoding for the chimeric receptor of any one of claims 13-32 transcriptionally coupled to a promoter.

35. A recombinant cell comprising the expression vector of claim 34 and a cell  
5 wherein the chimeric receptor is expressed and is functional.

36. A recombinant cell produced by combining a vector comprising the nucleic acid of claim 33 and elements for introducing heterologous nucleic acid into a cell wherein the chimeric receptor is expressed, and said cell.

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37. A process for the production of a chimeric receptor comprising:  
growing procaryotic or eukaryotic host cells comprising a nucleic acid sequence expressing the chimeric receptor of any one of claims 13-32, under suitable nutrient conditions allowing for cell growth.

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38. A method of measuring the ability of a compound to effect GABA<sub>B</sub>R or mGluR activity comprising the steps of:

a) providing said compound to a cell expressing the chimeric receptor of any one of claims 13-32, and

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b) measuring the ability of said compound to affect the activity of said receptor as an indication of the ability of said compound to effect GABA<sub>B</sub>R or mGluR activity.

39. The method of claim 38, wherein said method measures activity at a GABA<sub>B</sub>R.

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40. The method of claim 38, wherein said method measures activity at a mGluR.

41. A fusion receptor polypeptide comprising a receptor and a G-protein  $\alpha$  subunit, wherein said G-protein  $\alpha$  subunit is fused to the intracellular domain of said  
30 receptor, provided that said receptor is not an adrenoreceptor.